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(Research/Review) Article

Networking Governance in Waste Management in Pekanbaru City

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Abstract: The issue of waste in urban areas, particularly in rapidly growing cities like Pekanbaru, has become a significant challenge for sustainable development. Waste composition is dominated by household waste, food scraps, plastics, paper, and waste from the trade and service sectors. This study aims to explore waste management in Pekanbaru City through the lens of networking governance, focusing on collaboration among various stakeholders. The research questions address who the key actors in waste management are, their roles, relationships, and the dynamics of networking governance. Additionally, it investigates the obstacles faced by the system and efforts to overcome these challenges. According to the 2024 DLHK report, the city's waste collection capacity is only able to handle 70% of daily waste, with the remaining waste accumulating in temporary storage areas, drainage systems, and vacant lots, creating environmental and public health risks. By mid-2025, Pekanbaru's waste management will rely heavily on third-party contractors. Using qualitative methods and a phenomenological approach based on Klijn and Koppenjan's (2016) Network Governance theory, this research will examine networking management, actors, interdependencies, institutional features, and the interactions involved. The findings are expected to provide data-driven policy recommendations for improving waste management in a sustainable, equitable manner. The research will also contribute scientific outputs in the form of indexed articles, comprehensive monographs, policy briefs, and documentary videos documenting the research activities.

Keywords: Networking Governance; Policy Recommendations; Stakeholder Collaboration; Sustainable Development; Waste Management

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1. Introduction

Journal of Future Artificial Intelligence and Technologies accepts research paper submissions that contain at least 4000 to 8000 words or around 8 to 20 pages for research articles and a maximum of 30 pages for review articles. The introduction must be written briefly, concisely, and clearly. The introduction must contain an explanation of the Research object, Methods that have been used previously, the Weaknesses and strengths of each method or may briefly allude to related work and/or hypotheses, Research problems Proposed solutions and/or approaches List of Contributions Rest of paper. The introduction section must be scientific and rich in citations. Use "maintext_" style for this paragraph. Pekanbaru is one of the cities that continues to attract people from Riau Province, given that it is the largest city and capital of Riau Province. Pekanbaru's population is growing every

year. Many people from Riau Province and other regions seek opportunities in Pekanbaru due to its increasing progress. The issue of waste management in Pekanbaru has become a major concern in the context of environmental policy and public governance. Since 2023, research has focused on the Evaluation of the Implementation of Organic Waste Management Policy in Pekanbaru (Lestari and Kamaruddin, 2023), which highlights the effectiveness of technical policy implementation in organic waste management. Then in 2024, the study developed with an environmental governance approach through Good Environmental Governance in Waste Management in Pekanbaru City (Putri and As'ari, 2024), which emphasized the importance of the principles of rule of law, participation and representation, access to information, transparency, accountability, decentralization, institutions, and access to justice in managing waste issues comprehensively.

Based on data from the Central Statistics Agency (BPS) in 2024, the population of Pekanbaru City has exceeded 1.1 million. With an average population growth rate of 2.3% per year, the city's daily waste generation has increased rapidly and is estimated to reach 800-1,000 tons per day.

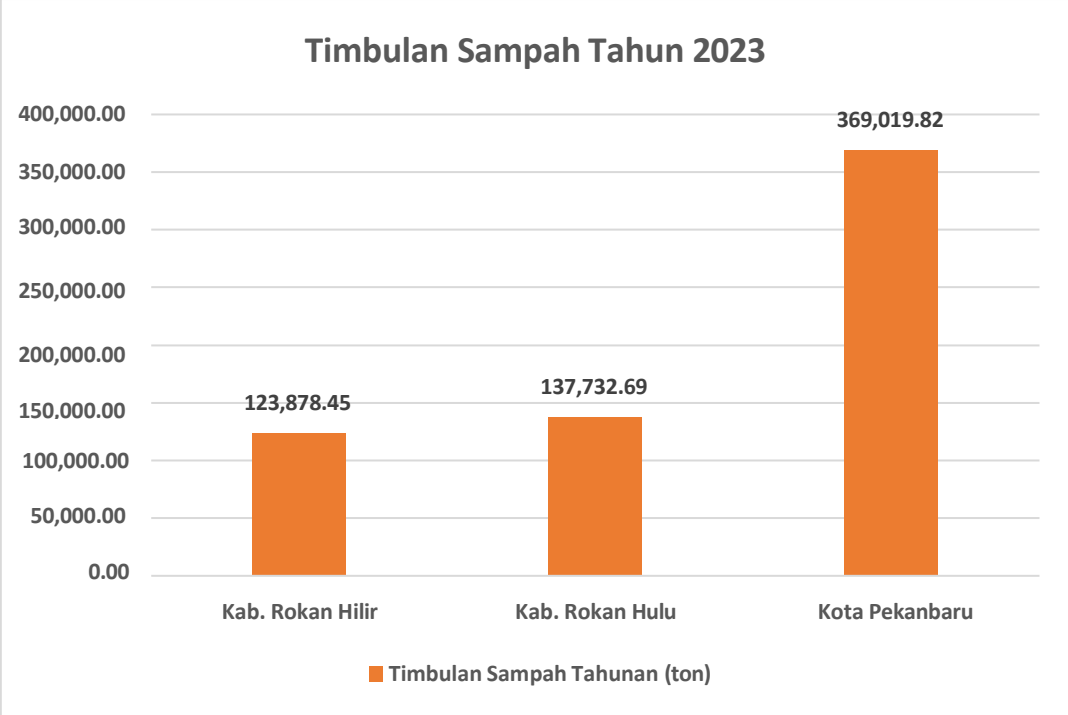

Figure 1. Highest Waste Generation in Riau Province in 2023

Source: National Waste Management Information System 2024

Based on Figure 1, it can be seen that in 2023, the city of Pekanbaru experienced an increase in waste generation of 369,019.82, which was the highest compared to Rokan Hilir Regency with 123,878.45 and Rokan Hulu Regency with 137,732.69.

However, along with the rapid growth in the city of Pekanbaru, there has also been an increase in the activities and consumption of the community. The increase in consumption activities by the community has certainly caused problems with the increase in the volume of waste every day. The people of Pekanbaru City have different lifestyles, supported by the influence of technology in this digital era.

As a result, the community has also experienced an increase in consumption patterns. This has certainly triggered an increase in the volume of waste in Pekanbaru City, resulting in the waste problem becoming an issue that has yet to be resolved to date.

The issue of waste in urban areas has become a major challenge in sustainable development, especially in cities with high population growth and economic activity. The composition of waste is dominated by household waste, food waste, plastic, paper, and waste from the trade and service sectors. Unfortunately, only a portion of the total waste generated can be handled optimally. Based on the 2024 DLHK report, the transportation capacity of the available fleet only covers 70% of the total daily waste generated. The rest piles up in temporary storage sites, drainage systems, and vacant lots, which have the potential to become sources of environmental pollution and public health hazards. Until mid-2025, the waste management system in Pekanbaru City will depend on third parties or private contractors.

However, various problems have arisen, such as inaccurate transport schedules, limited vehicle access to narrow alleys, public complaints about services, and low transparency and accountability in contracts. The DLHK evaluation noted that 40% of residential areas were not served regularly, and 25% of TPS experienced waste overload. Faced with these problems, the Pekanbaru City Government, through Mayor Agung Nugroho, took policy reform measures by forming a Waste Management Agency (LPS) at the sub-district level. This policy is outlined in Mayor Regulation (PERWAKO) Number 28 of 2023 concerning the Implementation Guidelines for Pekanbaru City Regional Regulation Number 8 of 2014 concerning Waste Management. The LPS concept emphasizes a community-based self-management system, where waste collection and transportation are carried out directly by residents organized under RT/RW and coordinated by the village LPS.

The LPS model has been implemented in 83 urban villages, and so far has shown mixed results. On the one hand, this approach is considered successful in reaching areas that were previously difficult for large fleets to access, such as narrow alleys or densely populated neighborhoods.

On the other hand, various obstacles remain, including the limited number of transport units, most of which are still obtained on credit or through grants; insufficient TPS and TPA in terms of both number and capacity; variations in managerial capabilities between sub-districts; a lack of technical training and incentives for field officers; low community participation in some areas due to a lack of socialization and the absence of an integrated waste management information system.

Another problem is the absence of an integrated waste management information system. LPS activity reports are still recorded manually, making it difficult to evaluate and make evidence-based decisions. In addition, there are no specific regulations that comprehensively regulate LPS operational standards, including aspects of retribution legality, officer work protection, and performance monitoring mechanisms.

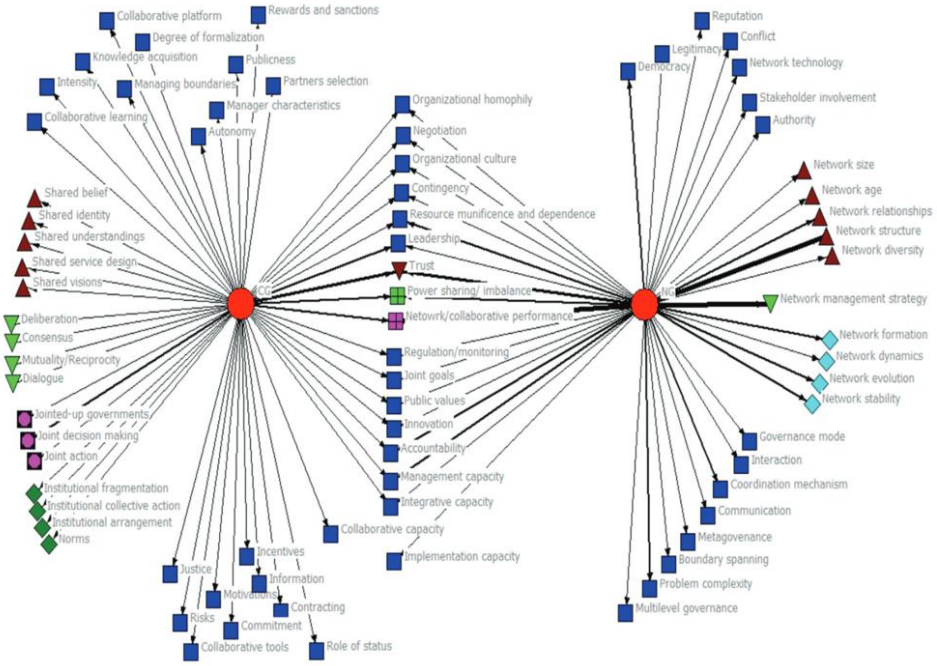

Figure 2. Networking Governance and Collaborative Governance Matrix
Source: Wang and Ran (2023)

Based on Figure 2, there are 16 common themes between Networking Governance and Collaborative Governance. One of them related to this study is the theme of network/collaboration performance, which focuses on how to measure its performance and the factors that influence it. In the waste management network in Pekanbaru City, stakeholders collaborate with the government and the community to form a Waste Management Institution (LPS). The tariff charged by the LPS for waste collection ranges from 20,000 to 200,000 per household. The categories of waste collected are household waste, household-like waste, and specific waste. Waste management in Pekanbaru requires three types of management, namely Reduce, Reuse, Recycle (3R).

This study aims to examine waste management from the perspective of networking governance in Pekanbaru City, with a focus on collaboration and cooperation among stakeholders. Through in-depth analysis, the results of this study are expected to provide data-based policy recommendations for strengthening adaptive, fair, and long-term waste management.

2. Preliminaries or Related Work or Literature Review

2.1. New Public Governance Concept

The concept of New Public Governance (NPG) is the latest development in governance theory. The book Public Administration New Public Governance (NPG) is a clear introduction to understanding the concept of New Public Governance in a comprehensive and detailed manner. There are five key concepts in NPG that are explained in detail in this book. The first is the concept of co-production. The reality in the field shows that relationships between actors in governance are not only difficult to build, but also that actors sometimes manipulate each other. This condition gave rise to a concept of public service provision that came to be known as co-production.

Here, the actors are no longer just the government and the private sector, but also involve citizens. The assumption of the co-production approach is that the quality of public services enjoyed by citizens will improve when citizens, especially those who are members of citizen-owned organizations, participate in the public service process. The second is the concept of hybrid organizations. Government organizations are required to become resilient organizations. This is the main objective behind the concept of 'hybrid organizations'. The key to achieving this is to create highly productive organizations, especially in terms of innovation.

2.2 Networking Governance

Networking governance is part of the New Public Governance concept, which specifically discusses network-based governance and focuses more on the relationships between stakeholders, including the government, the private sector, and the community. The concept of Networking Governance includes several indicators, namely: (Klijin and Koppenjan, 2016)

2.2.1. Networking Management

The complexity of processes within a network requires guidance and management of interactions, which is commonly referred to as network management. This activity aims to facilitate interactions, exploit content, and regulate interactions between actors. Management of interactions here refers to how the network facilitates existing stakeholders to sit together and engage in dialogue to achieve agreed-upon goals, which is usually done by holding joint meetings.

2.2.2. Actors, Interdependency, and frames

Policy delivery and services are shaped and implemented within a network of actors who are interdependent. This indicator implies that each institution within the network has its own authority and responsibilities. These responsibilities must be carried out with a strong commitment that will lead to the achievement of the common goals agreed upon at the outset. In this study, the researcher will explain the authority of each agency within the network.

2.2.3. Institutional features

Inter-institutional relationships will also lead to the emergence of regulations that govern the behavior of organizations within the network, or if this is not possible, the network governance that is implemented must refer to the regulations above it, so that the network governance used will not deviate from the predetermined rules. In network governance, there are regulations above it to regulate network governance so that it remains on track to achieve common goals. In this study, the researcher analyzes how the regulations above it serve to ensure that the actions taken by participants in network governance remain within the predetermined corridor.

2.2.4. Interactions and complexity

As a consequence of interdependence between actors and differences in perception, interactions and negotiation patterns will emerge in problem solving. The network governance approach emphasizes that the implementation of a policy involves the intervention of many actors, not the actions of a single actor. These negotiations and problem-solving arise with a program that will be produced later. In the governance between the three agencies as described earlier, it will have an impact on what program is produced to overcome existing problems.

2.3 Waste Management Agensi (LPS)

The waste management agency (LPS) is an agency formed by the community and facilitated by the local government for the purpose of waste management. The waste management agency (LPS) is regulated by Pekanbaru Mayor Regulation No. 28 of 2023 concerning Implementation Guidelines and Pekanbaru City Regulation No. 8 of 2014 concerning Waste

Management. Waste Management Institutions (LPS) may originate from initiatives by Regionally Owned Enterprises, Cooperatives, Private Enterprises, and/or community groups engaged in waste management (PERWAKO No. 28 of 2023).

The Waste Management Institution (LPS) has the right to collect waste fees based on agreements made by the community in their respective neighborhoods. The Waste Management Institution (LPS) is obligated to transport waste within a maximum of 2 days after the last day of transportation, comply with the operational hours for transporting waste to the TPS, and comply with the provisions of cooperation with the local government in accordance with the provisions of laws and regulations.

The process of establishing an LPS begins with a consultation with the community, followed by the establishment of the LPS by the sub-district, accompanied by minutes of the consultation, letters of approval from the neighborhood and community associations, and a letter of recommendation from the village head. Finally, an operational permit is submitted to the DLHK (the operational area is adjusted to the village area).

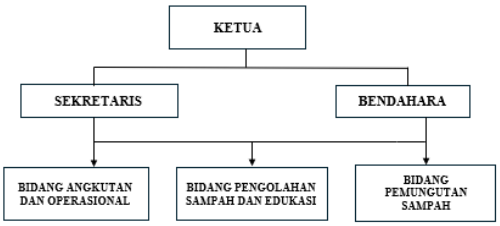

Figure 3. Structure of the Waste Management Institution (LPS)
Source: Prokopim, 2025

Based on Figure 3, from the established hierarchy, the organizational structure of the Waste Management Institution (LPS) of Pekanbaru City shows a fairly systematic and functional institutional pattern. This structure consists of several important elements that have their respective roles in supporting the smooth operation of waste management. At the highest position is the Chair, who is responsible for strategic decision-making and leading the overall running of the agency. The Chair is assisted by the Secretary, who plays a role in managing administration, documentation, and internal and external communication of the agency. Next is the Treasurer, who has the important task of managing finances, preparing financial reports, and ensuring transparency and accountability in fund management.

This structure also includes three main technical areas that support the daily operations of the LPS. The first is the Transportation and Operations Division, which is responsible for arranging waste transportation schedules, managing the fleet, and supervising field operations. Second, the Waste Management and Education Division, which not only manages the waste sorting and recycling process, but also plays a role in conducting outreach, training, and educational campaigns to the community to raise awareness and concern about the importance of sustainable waste management. Third, the Waste Collection Division, which handles the collection of fees, customer data tracking, and ensures the smooth running of the financing aspects from the community as part of a public service system oriented towards citizen participation.

Figure 4. Roadmap Penelitian
Sumber: Olahan Peneliti, 2025

3. Proposed Method

This study uses a qualitative method with an explanatory phenomenological approach. The concept of phenomenology is as follows: (V. Wiratma Sujarweni, 2014)

The first concept is that every phenomenon or event that arises consists of a series of surrounding events; in other words, the event never stands alone. Phenomenology also appears not to be actual facts or reality. In this study, RT/RW and community leaders had new experiences in coordinating directly with the village government apparatus compared to their previous experiences with the private sector. Some felt that this approach was more open and participatory, while others felt that the process was not yet sufficiently responsive, especially in terms of technical operations or citizen complaints. In addition, field officers or waste collectors also experienced a transition in their job status and supervision system, which affected how they carried out their daily tasks and their perception of the system's bias towards them. Meanwhile, the waste bank community and residents involved in sorting assessed that these changes provided new hope for stronger synergy, even though they still faced coordination issues and resource constraints.

Using a phenomenological approach, this study seeks to capture the social reality behind formal policies, including the dynamics of networks that are formed naturally and structurally. This reinforces the position of the networking governance approach as the main analytical framework, which emphasizes the importance of synergy, relational experiences, and subjective meanings in building sustainable waste management governance that is responsive to community needs.

The second concept is rooted in qualitative research methods, focusing on abstract and symbolic data with the aim of understanding the symptoms that arise as a whole.

The third concept is that the problem is caused by the perspective of the subjects of this study, namely the Pekanbaru City Government, the Environment and Hygiene Agency (DLHK), and the Waste Management Agency (LPS). Therefore, different subjects will have different experiences in understanding the same phenomenon from different perspectives. Through in-depth interviews, the researcher sought to understand people's behavior through their perspectives. The qualitative approach adopted in this study is in line with the focus on networking governance in waste management in Pekanbaru City, as it allows the researcher to gain an in-depth understanding of collaboration in waste management in Pekanbaru City. Persuasively, the government regulated illegal waste disposal sites (TPS), which became the basis for the establishment of the Waste Management Agency (LPS) in the sub-districts of Tangkerang Tengah, Tangkerang Labuai, Air Dingin, and Simpang Tiga.

3.1. Type of Data

This study uses primary and secondary data. Primary data is data obtained directly by interviewing informants obtained through direct research related to the problem, such as responses from informants during field observations. In addition, secondary data in this study was obtained indirectly from its sources. This secondary data is usually taken from documents such as reports, scientific papers, newspapers, magazines, and so on.

3.2. Data Analysis

In addition, researchers also used bibliometric analysis to identify research gaps by collecting 1,000 articles from Google Scholar and justifying them using the keyword "networking governance." The results can be seen in this figure.

The data for analyzing the facts found in the field was collected using the Interactive Theory Model (Miles et al., 2014). The data analysis process in this study was carried out in three stages, namely.

3.2.1. Data condensation

Data condensation refers to the process of selecting, simplifying, abstracting, and/or transforming data that approximates the entirety of written field notes, interview transcripts, documents, and other empirical materials related to Networking Governance in waste management in the city of Pekanbaru.

In this study, condensation was carried out by selecting informants involved in Networking Governance in waste management in Pekanbaru City. After selecting the informants, the researcher drafted interview questions, limited the questions based on the problem formulation, and conducted direct interviews. In addition, the researcher also recorded all answers using a mobile phone. The recordings were then used to double-check the interview transcripts. At this stage, the data collected up to the simplification stage was evaluated by the

researcher. After that, the researcher combined the interview results of each informant and summarized them into continuous sentences to facilitate the observation of each discussion in the data analysis. This stage was the final stage in data condensation. Next, the researcher moved on to the next stage, which was data presentation.

3.2.2. Data Presentation

The next step after the data condensation process was data presentation. Data presentation is structured information that allows for conclusions to be drawn and actions to be taken. The data and information obtained from interviews, observations, and documentation at the research site are presented in the form of interview notes, field observation notes, and documentation notes, which are then compiled to make it easier for researchers to understand what happened in accordance with the phenomenon and what the researchers should do, as well as to enable researchers to perform analysis quickly and easily. The data obtained in this study is based on the results of interviews with relevant parties. After collecting data on networking governance in waste management in the city of Pekanbaru, the researchers then grouped the results of the observations and interviews to be presented and discussed in more detail. At this stage, the researcher presented the data through brief descriptions of each informant separately based on the research indicators to convey the information obtained as an overview of the analysis of networking governance in waste management in Pekanbaru City.

3.2.3. Drawing Conclusions

Conclusions were drawn during the research process, starting from the data condensation and adequate data presentation stages. Once the data was complete as required, the final conclusions were drawn and verified to ensure they were accountable based on the data obtained. Drawing conclusions is evidence of the research conducted.

4. Results and Discussion

4.1. Actors Involved in Waste Management in Pekanbaru City, as well as the Roles and Relationships of Each Actor in Waste Management in Pekanbaru City

Waste management in Pekanbaru City involves several key actors, consisting of the Mayor of Pekanbaru, the Pekanbaru City Council, the Environment and Sanitation Agency (DLHK), the Waste Management Technical Implementation Unit (UPT Pelayanan Persampahan), the Landfill Technical Implementation Unit (UPT TPA), the Waste Management Agency (LPS), the private sector (PT ICE Victory), and the community. The roles and relationships between these actors are dynamic interactions between various parties, namely the Mayor of Pekanbaru, the Pekanbaru City Council, the Environment and Sanitation Agency (DLHK), the Waste Management Technical Implementation Unit (UPT Pelayanan Persampahan), the Landfill Technical Implementation Unit (UPT TPA), the Waste Management Agency (LPS), the private sector (PT ICE Victory), and the community.

As the head of the Pekanbaru City government, the Mayor plays a crucial role in determining the direction of policies and regulations related to waste management. Through the decisions made, the Mayor has the authority to formulate policies and lead the implementation of waste management in the city. In an interview with Mr. Ingot Ahmad Hutasuhut, Assistant II for Economy and Development, at the 2025 Green City Innovation Workshop, it was explained that Mayor Regulation (Perwako) Number 26 of 2025 was a strategic step issued by the Pekanbaru City Government to restructure the waste management system, especially after the expiration of the contract with the third party. In this case, the Mayor has full responsibility for policy, licensing, and management of the Final Disposal Site (TPA).

".....We issued this new Perwako (Perwako Number 26 of 2025) to reinforce and restructure the waste management system after the expiration of the contract with third parties such as PT Ella Pratama Prakasa. The main actor now, in terms of policy, remains the Pekanbaru City Government through the Environment and Cleanliness Agency (DLHK), which is fully responsible for policy, licensing, and landfill management..." said Mr. Ingot Ahmad Hutasuhut, Assistant II for Economy and Development, at the 2025 Green City Innovation Workshop on November 8, 2025.

The Pekanbaru City Regional Representative Council (DPRD), particularly Commission IV, has a very strategic role in waste management in this city. As a legislative body that functions as an overseer of government policies, the DPRD is responsible for ensuring that the waste management policies implemented in Pekanbaru City comply with applicable regulations. Through the oversight carried out by Commission IV, the DPRD can ensure that every step taken by the government, the private sector, and the community in waste management

is in accordance with the plans that have been prepared and meets the established standards. Based on an interview with Mr. Hamdani, a member of Commission IV of the Pekanbaru City DPRD, it was explained that the DPRD has a primary function in overseeing the policies implemented by the Pekanbaru City Government related to waste management.

".....Commission IV of the DPRD facilitates interaction through deliberative meetings at the village level, which involve the community in determining waste managers. They also receive complaints from the community and coordinate with the LPS and DLHK to resolve existing problems,..... " (Said Mr. Hamdani as a member of Commission IV of the Pekanbaru City DPRD on October 19, 2025).

The Pekanbaru City Environment and Sanitation Agency (DLHK) plays a very important role in the city's waste management system. As a government agency responsible for waste management policy and implementation, the DLHK functions not only as a policy manager but also as a technical implementer in the field. With this dual role, the DLHK is tasked with overseeing policy implementation and providing guidance and support to Waste Management Institutions (LPS) and the private sector involved in waste management. Through a focus group discussion with Mr. Reza Aulia, Head of the DLHK of Pekanbaru City, it was explained that the DLHK has broad responsibilities, ranging from policy planning to operational supervision in the field.

".....The DLHK acts as a policy director and technical supervisor in waste management. We provide guidance on the management of Final Disposal Sites (TPA), as well as carry out a supervisory function towards LPS and the private sector to ensure that waste management is carried out in accordance with applicable standards....." (Stated by Mr. Reza in a Focus Group Discussion (FGD) held on November 4, 2025).

The Integrated Service Unit (UPT) for Waste Management under the Pekanbaru City Environment and Sanitation Agency (DLHK) plays a very important role in the operational management of waste in the city. As a unit focused on policy implementation in the field, the Waste Management Service UPT is responsible for supervising and ensuring the smooth running of the entire waste management process, from transportation and sorting to waste processing. This task involves close coordination with various related parties, including the Waste Management Agency (LPS), the private sector, and the community. In an interview with Mr. Wahyu, Head of the DLHK Pekanbaru City Waste Management Technical Implementation Unit, he explained that the Technical Implementation Unit acts as a liaison between the government, the private sector, and the community in waste management.

".....We ensure good coordination between the LPS, the private sector, and the community. We are also tasked with providing guidance to the LPS to ensure that waste management runs well and in accordance with established policies....," (said Mr. Wahyu in an interview on October 14, 2025).

One important innovation in waste management at the landfill is the processing of waste into energy. The landfill UPT collaborates with the private sector, such as PT. ICE Victory, which has the technology to convert methane gas produced from the decomposition of waste at the landfill into electrical energy. Methane gas is a by-product of the decomposition of organic waste at the landfill, which can potentially damage the environment if not managed properly. However, with the technology to convert methane gas into electrical energy, waste that would otherwise be an environmental problem can be utilized as a useful resource. Mr. Reza Aulia, Head of the Pekanbaru City DLHK, explained,

"We are working with PT. ICE, which manages methane gas at the landfill and converts it into electrical energy. This collaboration is a concrete example of our efforts to improve waste management in a more environmentally friendly and sustainable manner."

LPS operates based on active coordination at the neighborhood and community association levels. The waste transportation service provided by LPS is based on an agreement on contributions from residents in each urban village. Although it was established with comprehensive waste management regulations, currently the majority of LPS in Pekanbaru still focuses only on transportation and has not yet reached the management stage.

"For this first year, we are indeed focused on waste transportation first, then gradually moving on to management, because for management we also have to prepare thoroughly, right? We need more land and human resources than the current LPS administrators have," (said the head of LPS Beriman, Tangkerang Utara Sub-District during the FGD session).

The Pekanbaru City Government, through the Environment and Sanitation Agency (DLHK), has collaborated with various parties to improve waste management in the city, one of which is with the private sector, namely PT ICE Victory. This collaboration is not limited to waste transportation, but also involves the utilization of waste for more productive

purposes, namely as a source of energy. PT ICE Victory, as one of the parties involved, plays a major role in developing technology that can convert waste into electrical energy through combustion or conversion of waste into fuel that can be used to generate electricity.

"We, the Pekanbaru city government, have also signed an MoU with a private company, PT ICE Victory, to collaborate on waste management. The purpose of this collaboration is to manage the accumulated waste and turn it into a source of electrical energy."

Active involvement also comes in the form of participation in waste bank or TPS3R programs, either as contributors of sorted waste, managers, or beneficiaries of the economic benefits of recycling. In maintaining environmental cleanliness, the community participates in mutual assistance activities, RT/RW environmental cleanliness, and ensuring that waste is not disposed of indiscriminately into rivers or drains. Support for policies is also an important part, such as complying with waste collection schedules, following disposal rules, and participating in socialization carried out by LPS. Finally, the community plays a role in reporting and monitoring, for example, reporting illegal waste disposal sites, inconsistencies in transportation services, and waste accumulation. All of these roles show that the LPS cannot work alone without the active support of residents in maintaining sustainable waste management.

"So far, after the LPS was formed, our role as a community has been more about maintaining environmental cleanliness and following the established waste disposal rules and paying fees as agreed. We have not been asked to sort waste, so our focus is currently on collecting waste at the designated place and time so that it does not pile up. Mutual cooperation is also carried out regularly, especially at the RT and RW levels, to keep the environment clean. If there are problems such as waste not being transported or people disposing of waste indiscriminately, we usually report it directly to the RT head or the LPS. So even though there is no obligation to sort waste, we still try to support the LPS program so that waste management in Pekanbaru City can be resolved immediately" (Interview with a member of the community in Delima Asri District).

Synergy and collaboration between actors are very important in creating efficient, sustainable, and environmentally friendly waste management in Pekanbaru City. Although networking governance has been implemented to coordinate between actors, challenges in coordination, communication, and public awareness remain the main obstacles that need to be overcome. Better collaboration between the government, the private sector, LPS, and the community is needed to ensure that waste management goals can be achieved successfully and sustainably. Efforts to improve communication, clarify roles and responsibilities, and increase community participation will further strengthen synergy between actors in waste management in Pekanbaru City.

4.2. The Dynamics of Networking Governance in Waste Management in Pekanbaru City

Networking governance is part of the New Public Governance concept, which specifically discusses network-based governance and focuses more on the relationships between stakeholders, including the government, the private sector, and the community. The concept of Networking Governance includes several indicators, namely: (Klijin and Koppenjan, 2016)

4.2.1. Networking Management

The Pekanbaru City Environment and Sanitation Agency (DLHK) plays an important role as a policy director and technical implementer, ensuring that the entire waste management process, from collection, transportation, and processing to final disposal, runs in accordance with applicable standards and regulations. However, in carrying out its duties, the DLHK requires assistance and cooperation from various actors. The following are the results of a focus group discussion with Reza, Head of the DLHK of Pekanbaru City, regarding the relationship between actors in waste management in Pekanbaru City.

"The Environment and Sanitation Agency (DLHK) manages relationships between actors through coordination and collaboration between various parties involved, namely the government, the private sector, the community, and the Waste Management Agency (LPS). We ensure smooth communication by holding regular meetings, either in person, through social media, or via our call center. Each actor is given a clear understanding of their roles and responsibilities, and the DLHK functions as a facilitator that unites the interests of all parties to achieve the same goals in waste management" (Focus Group Discussion (FGD) with the Environment and Sanitation Agency, Mr. Reza Aulia as Head of the DLHK on November 4, 2025).

4.2.2. Actors, Interdependency, and frames

Policy delivery and services are shaped and implemented within a network of actors who are interdependent. This indicator implies that each institution within the network has its own authority and responsibilities. These responsibilities must be carried out with a strong commitment that will lead to the achievement of the common goals agreed upon at the outset. In this study, the researcher will explain the authority of each agency within the network.

".....It should be understood that we issued Perwako 26 of 2025 to reinforce and restructure the waste management system after the expiration of the contract with third parties such as PT Ella Pratama Prakasa. The main actor now, in terms of policy, remains the Pekanbaru City Government through the Environment and Sanitation Agency (DLHK), which is fully responsible for policy, licensing, and landfill management. However, there are significant changes in the field. We are returning operational management to the regional level, namely the sub-district and village authorities as coordinators in their respective areas," explained Mr. Ingot. "This is where the central role of the Waste Management Agency (LPS) comes in. The LPS is an official village-based agency, covering RT/RW, which has obtained an operational permit from the DLHK. They are the spearhead that transports waste directly from people's homes. For now, our focus is on self-management by the LPS. However, we also remain open to opportunities for private parties or investors if there is cooperation in waste processing technology investment at the landfill. In essence, the key actors in the Perwal 26/2025 system are: the City Government (via DLHK), Subdistricts/Villages, Waste Management Institutions (LPS), and of course, the community..." (Statement by Mr. Ingot Ahmad Hutasuhut, Assistant II for Economy and Development, at the Green City 2025 Innovation Workshop on November 8, 2025).

4.2.3. Institutional features

Inter-institutional relationships will also lead to the emergence of regulations that govern the behavior of organizations within the network, or if this is not possible, the network governance that is implemented must refer to the regulations above it, so that the network governance used will not deviate from the predetermined rules. In network governance, there are regulations above it to regulate network governance so that it remains within the corridor to achieve common goals. In this study, the researcher analyzed how the regulations above it serve to ensure that the actions taken by participants in network governance remain within the predetermined corridor.

"This new Perwako was drafted because there were several things that needed to be adjusted in the field. We want the implementation rules to be clearer, especially in the division of roles between DLHK and LPS so that there is no overlap" (Focus Group Discussion (FGD) with the Environment and Sanitation Agency, Mr. Reza Aulia as Head of DLHK on November 4, 2025).

4.3. Challenges faced by networking governance and efforts to resolve issues in waste management in Pekanbaru City

Networking governance is part of the New Public Governance concept, which specifically discusses network-based governance and focuses more on the relationship between stakeholders, including the government, the private sector, and the community. The concept of networking governance includes several indicators, namely: (Klijin and Koppenjan, 2016)

However, even though there are many actors with important interests and roles, in practice there are often obstacles in waste management caused by difficulties in building effective networks between these actors. Limited coordination, inefficient communication, and a lack of clarity regarding the roles of each actor are some of the factors that hinder the implementation of optimal waste management in the city of Pekanbaru.

4.3.1. Limited coordination between the actors involved

Limited coordination between actors involved in waste management in Pekanbaru City is one of the most profound obstacles. Mr. Reza Aulia, Head of the Environment and Sanitation Agency (DLHK), revealed in an interview that although various parties, such as LPS, UPT Pelayanan Persampahan, and the government, have tried to work together, ineffective coordination remains a major challenge

".....The obstacles we face are low public awareness and participation in waste management, as well as the inability of some actors to fulfill their responsibilities. Some LPS are not yet able to manage waste optimally, and there are obstacles in terms of human resources and budget to manage waste properly. To overcome this problem, the DLHK provides guidance

and supervision to the LPS and continues to encourage active community participation through socialization and education on the importance of good waste management..." (Focus Group Discussion (FGD) with the Environment and Sanitation Agency, Mr. Reza Aulia as Head of the DLHK on November 4, 2025).

4.3.2. Lack of regular interaction between actors

The lack of regular interaction between actors is a problem that greatly affects the smooth running of waste management in the city of Pekanbaru. The following is an interview with Mr. Hamdani, Member of Commission IV of the Pekanbaru City Council.

"Commission IV of the City Council resolves complex waste management issues by holding meetings or hearings between LPS, DLHK, and the community to find joint solutions. The City Council also ensures that existing regulations are complied with by all parties and provides the necessary technical improvements to increase the efficiency of waste management" (Interview with Hamdani, member of Commission IV of the Pekanbaru City Council).

4.3.3. Information fragmentation

Information fragmentation is one of the obstacles that greatly affects the effectiveness of waste management in Pekanbaru City. Fragmented information between the government, LPS, and the community leads to decision-making that is not based on accurate data. This can create obstacles that greatly hinder waste management if left unaddressed and no feasible solutions are provided.

".....The lack of an integrated information system leads to decision-making that is not based on accurate and real-time data, which ultimately hinders waste management. Without integrated information, each actor works with limited data and is often unable to access the information needed to make the right decisions. The lack of an integrated information system results in decision-making that is not based on accurate and real-time data, which ultimately hinders waste management...." (Interview with the Head of the Waste Management Technical Implementation Unit of the Pekanbaru City DLHK, Mr. Wahyu, on October 14, 2025).

4.3.4. Discrepancies in duties and responsibilities and differences in perception among actors

In waste management, the involvement of various actors with their respective roles and responsibilities is a must to ensure an effective and efficient management system. The main actors in the waste management system in Pekanbaru City, such as the government (Mayor, DLHK and UPT Waste Management Services), LPS (Waste Management Agency), and the community, have different but interrelated tasks. If each of these actors functions properly in accordance with their duties and responsibilities, they will create a well-coordinated system that enables optimal waste management. However, there are often gaps in the duties and responsibilities between actors that disrupt the smooth running of the waste management process.

".....the biggest obstacle is the difference in interests and perceptions between the various actors involved, be it the government, the private sector, or the community. In addition, suboptimal coordination at the village and sub-district levels is also an obstacle to ensuring effective waste management....." (Focus Group Discussion with the Environment and Sanitation Agency on November 4, 2025).

4.4. Networking Governance Model in Waste Management in Pekanbaru City

By understanding institutional dynamics, obstacles in the field, and long-term goals, various networking governance models can be offered as alternatives to strengthen waste management in Pekanbaru City. Each model not only provides an overview of the structure of relationships between actors, but also presents directions for system reform, capacity building strategies, and long-term sustainability mechanisms. These models then become the analytical basis and practical recommendations for building a more effective waste network that is responsive to the city's evolving needs.

a. Coordinative Network Model

This model describes a network that still places the DLHK as the central node or steering node. The government holds dominant control over policy-making, SOPs, workflows, volume targets, and sorting standards. UPT and LPS are positioned as technical implementers that follow hierarchical instructions. This pattern still dominates the waste management system in Pekanbaru City because the transition to Perwako 26/2025 is still in its early stages. This model maintains stability during the transition period when LPS capacity is not yet evenly distributed and Transfer Depots are not yet fully functioning as sorting nodes. However, its

main weakness is that the network becomes rigid, lacks innovation, and relies too heavily on the government's capabilities, preventing the optimal development of the roles of the community and LPS.

b. Collaborative Network Model

In this model, the network moves from a hierarchical pattern to a co-governance pattern, where all actors, DLHK, UPT, LPS, the community, DPRD, and the private sector are involved in policy formulation, operational evaluation, and strategic discussions. Monthly or quarterly collaborative forums become the main mechanism for equalizing the positions of actors. This model allows for two-way information exchange and joint capacity building. In the context of Pekanbaru, this model is particularly needed because there are many discrepancies in perception between the community, LPS, and the government that can be resolved if there is a formal deliberation space. The challenge is adjusting the bureaucratic culture and the readiness of all parties to accept a more equitable distribution of power.

c. Community-Based Network Model

This model places the LPS and the community as the most strategic nodes in reducing waste at the source. The LPS is no longer just a transport actor, but also a center for education, an agent for sorting waste from households, a driver of waste banks, and a circular economy actor at the village level. The community becomes a key actor in shaping new behaviors in the form of waste sorting and discipline in waste disposal times. In the context of Pekanbaru, this model is highly relevant because the biggest problems currently lie at the household level: waste is not sorted, volumes are increasing, and indiscriminate disposal is still common. This model aims to build a network rooted in the community, not just the government.

d. Integrated Information Network Model

This model offers a data system that brings all actors together in a single information flow. A shared application or dashboard is needed to display data on daily waste volume, Transfer Depot capacity, transportation routes, LPS reports, and community complaints. Real-time data enables DLHK to conduct evidence-based monitoring, UPT to optimize routes, LPS to report activities accurately, and the community to know the schedule and quality of services. This model is very important because currently the flow of information is still fragmented, manual, and dependent on informal communication. Without a robust information system, the network cannot develop into an adaptive and efficient governance structure.

e. Circular Economy Network Model

This model builds cross-actor relationships in order to turn waste into an economic resource. LPS becomes the initial sorting node, Transfer Depo as the advanced sorting point, recycling MSMEs as raw material users, and the private sector as a processing technology partner. Organic waste can be processed into compost or maggot feed, while economically valuable inorganic waste is directed to collectors or recycling industries. This model not only reduces pressure on landfills but also creates jobs, local income, and economic incentives for the community to participate in sorting. In the case of Pekanbaru, this model has great potential due to the high volume of organic and plastic waste that has not yet been utilized.

f. Sustainable Multi-Actor Networking Model

This model is the most mature form of networking governance. Here, all actors work not only to fulfill technical functions, but also to achieve social, economic, and environmental sustainability goals. The DLHK acts as an innovation facilitator, the UPT acts as a responsive technical supervisor, the LPS acts as an education and sorting center, the community acts as data producers and agents of behavioral change, the private sector provides technological support and investment, Transfer Depo functions optimally as a material flow control node, and the DPRD acts as the guardian of regulatory legitimacy. Sustainability is ensured through clear role sharing, routine evaluation mechanisms, mutual commitment, and long-term incentives for all actors.

g. Incentive and Compliance Network Model

This model regulates the actor motivation scheme so that the network can survive in the long term. Incentives can take the form of reduced fees for households that sort waste, performance awards for LPS, or financial support for recycling MSMEs. Compliance is strengthened through budget transparency, service audits, and data-based reporting. This model is crucial because the biggest challenge for networks is not only building capacity but also maintaining consistent participation from the community and LPS. In Pekanbaru, incentives are essential because behavioral change cannot be enforced through regulation alone.

h. Public–Private Partnership Network Model

This model strengthens the network by involving the private sector in the provision of transportation facilities, waste processing technology, data collection systems, and investment in processing facilities. The government regulates service standards and conducts supervision, while risks and operational costs are shared with the private sector. This model accelerates modernization and reduces the burden on the regional budget. In the context of Pekanbaru, this model can cover the limitations of the UPT's fleet and technical capacity.

i. Integrated Transfer Depot Network Model

This model makes the Transfer Depot not only a transit point but also a strategic hub that controls the flow of materials based on sorting. LPS conducts initial sorting, then the Transfer Depot separates organic, valuable inorganic, and residual materials. With integrated data collection, the Transfer Depot can direct waste to recycling channels or organic processing facilities. This model addresses the most obvious weakness in the Pekanbaru system, namely the lack of sorting, which causes the Transfer Depot to become merely a dumping ground.

5. Comparison

The study entitled "Networking Governance in Waste Management in Pekanbaru City" aims to explore the existing conditions in waste management in Pekanbaru City. This study aims to identify the current phenomena in waste management in Pekanbaru City. In addition, this study also aims to identify the obstacles in waste management in Pekanbaru City.

5.1. Community Obligations in Maintaining Environmental Sustainability Through Community-Based Waste Management (Purwendah and Periani, 2022).

This study aims to identify and analyze how waste management is related, identify and analyze the role of waste banks in waste management, and identify and analyze community-based waste management. The type of research used is normative legal research. The data obtained from this study is secondary data obtained through literature study, then the data obtained is analyzed qualitatively through a legislative and conceptual approach. The results of this study show that (1) the waste management system is a waste management process that covers five aspects, namely institutional aspects; financing; regulation; operational techniques; and community participation, (2) in its implementation, waste banks can reduce the high amount of waste in the community and in landfills. Thus, through the Waste Bank, it becomes an alternative solution for the government and the community in reducing the increasing volume of waste. (3) Community-based waste management is an approach to waste management based on active community participation. Environmental management requires the facilitation and implementation of community-based efforts as a strategy for empowerment and increasing their access to environmental resources.

5.2. Community empowerment in sustainable waste management: A case study in Kampung Salo Kendari (Yasin and Pratiwi, 2024).

This article explores community empowerment in sustainable waste management in Kampung Salo, an initiative that combines environmental sustainability principles with active community participation. Through applied research methods, this study identifies strategies and challenges in implementing waste management programs that directly involve the community. This research reveals that community empowerment plays a key role in the success of sustainable waste management in Kampung Salo. Findings show that despite progress in community awareness and participation, there are still significant obstacles that need to be overcome, including limitations in infrastructure and resources. Successful waste management practices, such as recycling and composting programs, demonstrate the potential for further development. However, to achieve effective and sustainable waste management, a more integrated approach is needed, involving all stakeholders, including the government, the community, and the private sector.

5.3. Community-Based Waste Management Becomes an Economic Product (Study in Gampong Nusa, Lhoknga District, Aceh Besar Regency (Mahlil, et al. and Furqan, M. 2021).

Community-based waste management is a large program that focuses on reducing plastic waste by turning it into items of economic value. Within the program, there are several subprograms that have produced derivative activities that have proven to have a real impact on people's lives. Community-based waste management in Gampong Nusa has also been in place since 2006. Its initial goal was to eliminate waste left behind after the tsunami disaster, but over time, waste management in Gampong Nusa has had a positive economic impact on the

community, and the products created by the people of Gampong Nusa are now sold to various groups. The results of the study show that community-based waste management has become an economically valuable product, making Gampong Nusa an environmentally friendly village and turning the results of waste management into economically valuable products. The strategy for community-based waste management to become an economically valuable product is to provide understanding and practice directly with the community, so that the results are clearly visible and the processed waste products can be directly utilized by the community.

5.4. Analysis of Community-Based Organic Waste Management Study at Gadang Market, Malang City (Septiadi, et al. and Permatahati, T. L. 2020).

The Malang City Government, in order to reduce the amount of waste entering the Supiturang landfill, needs to implement a community-based waste management system. This waste management system requires a link between the best waste management theory, the appropriate legal basis, and clear policies so that it can be handled properly, effectively, and efficiently. Not only that, waste management, especially that which involves the community, cannot be separated from the role of the government, the private sector, and the community itself. The results of the study show that community-based organic waste management at Gadang Market in Malang City involves the active participation of traders in cleaning and collecting waste from their stalls. Although most traders have made efforts to maintain cleanliness, awareness of the importance of cleanliness still varies. Independence in waste management can be seen from the efforts of traders to clean their own sales areas, although some still depend on cleaning staff. Efficiency in waste management is not yet optimal, with much waste not being handled properly. Environmental protection has been carried out through routine cleaning and the provision of trash bins, but coordination between vendors and cleaning staff needs to be improved in order to maintain the overall cleanliness of the market. Overall, despite positive efforts in waste management, improvements are still needed in the areas of independence, efficiency, and cooperation between parties to achieve better results.

5.5. Study of Community-Based Waste Management in Gucialit Village, Gucialit District, Lumajang Regency (Mawardi, et al. and Listyawati, R. N, 2022).

This study shows that there are three main factors that influence community participation in waste management, namely length of residence, education level, and income level. The most preferred form of participation by Gucialit Village residents is in the form of labor, with a percentage of 80%, while the other 20% choose to contribute financially because they have received services from sanitation workers. To improve community-based waste management in Gucialit Village, several strategic steps are recommended, including conducting socialization and education on waste management, conducting training to improve skills, forming Environmental Cadres and Dasawisma groups, optimizing the function of the Waste Bank, constructing Temporary Waste Disposal Sites (TPS), monitoring waste management violations, and adding sanitation workers in RW 6 and RW 7 areas.

5.6. Waste Management from the Smallest Level and Community Empowerment as a Form of Environmental Care (Juniartini, 2020).

The results of this study show that waste management at the household level in Indonesia faces significant challenges, especially related to public awareness of the importance of effective waste management. The study identified three types of waste: organic, inorganic, and hazardous materials. The implementation of the 5R principle (reduce, reuse, recycle, replace, repair) is expected to change the way people manage waste.

Through the empowerment of community organizations, such as PKK (Family Welfare Empowerment) at the village level, the community can obtain education on simple but effective waste management. This increases creativity in processing waste into useful products, such as compost from organic waste.

In addition, the study also found that by forming working groups in the community and increasing collaboration between the government, academics, and the community, waste management can be carried out in a more structured and sustainable manner. Education on waste sorting and processing is expected to facilitate the work of waste collectors and create a cleaner and healthier environment.

6. Conclusions

Based on the results of the study, the conclusions of this study are as follows. Waste management in Pekanbaru City faces a number of challenges, particularly related to institutional transition, which began with the transfer of duties from third parties to the Waste Management Agency (LPS) at the village level. Although regulated by Pekanbaru Mayor

Regulation No. 26 of 2025, the implementation of waste management has not been fully effective. Coordination between actors, low public awareness, limited resources, and the suboptimal functioning of the Transfer Depot and LPS are the main problems in the waste management system that is currently being developed. The networking governance approach offers a solution by emphasizing the importance of collaboration and coordination among the actors involved, including the government, the private sector, the LPS, and the community. Although there are several models that can be applied, such as the coordinative, collaborative, and community-based network models, each model has challenges and needs to be strengthened through capacity building, integrated information systems, and greater support from various parties.

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